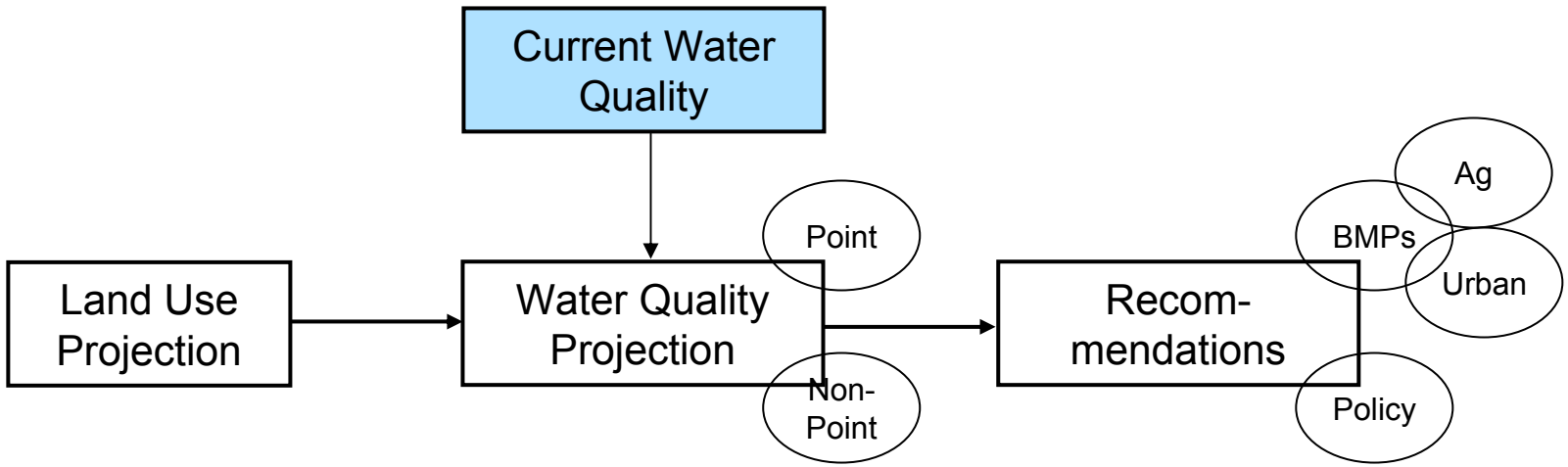
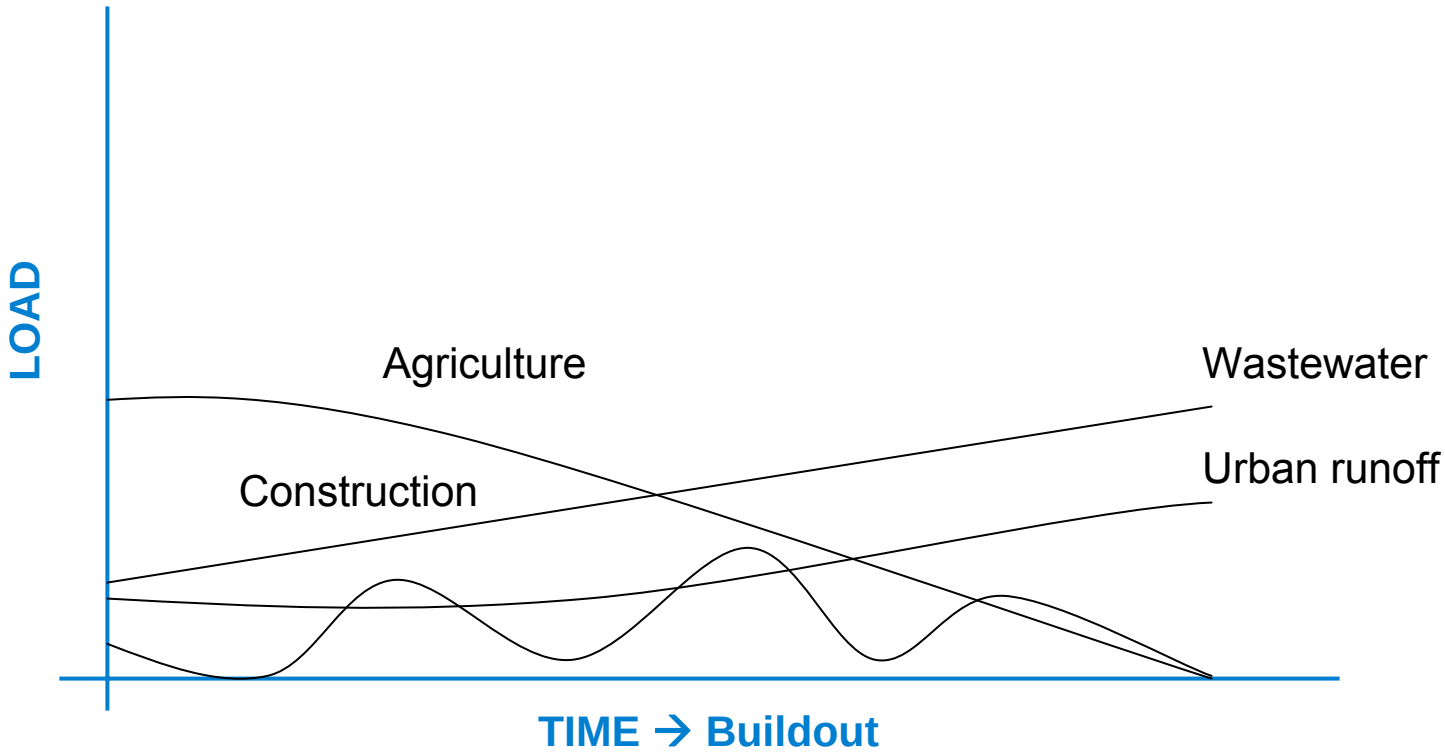
Chicago Metropolitan Agency for Planning

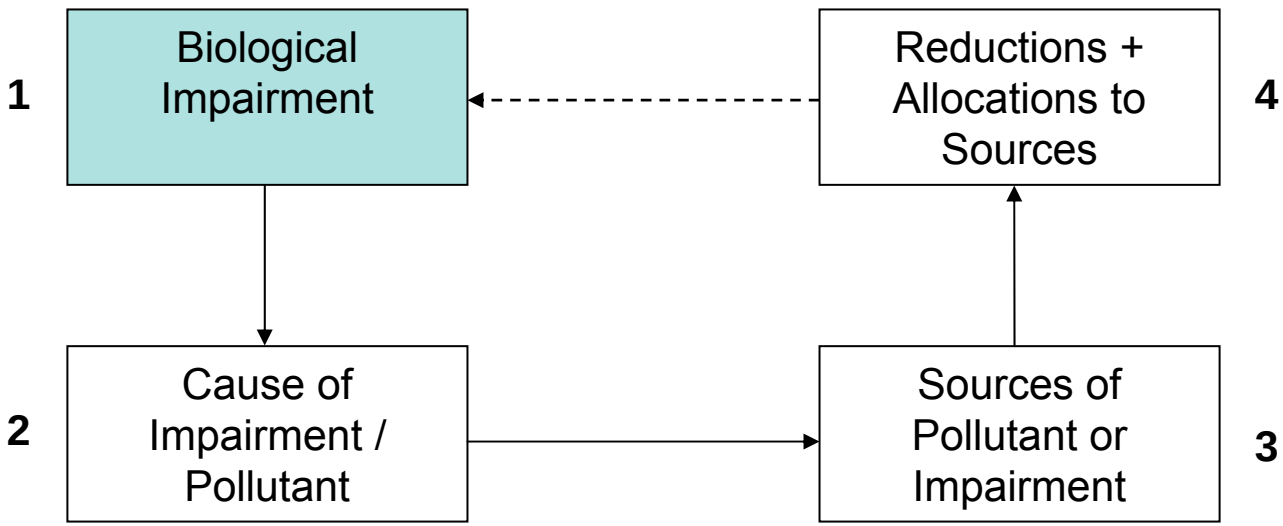
Water Quality Targets
Beaver Creek Watershed
November 14, 2007

Process


Current Water Quality
Land Use Projection
Water Quality Projection
Point
Non-Point
Recom-mendations
Ag
BMPs
Urban
Policy

Effects over time (conceptual)




1
Biological Impairment
Reductions + Allocations to Sources
4
2
Cause of Impairment / Pollutant
Sources of Pollutant or Impairment
3

Biological Indices

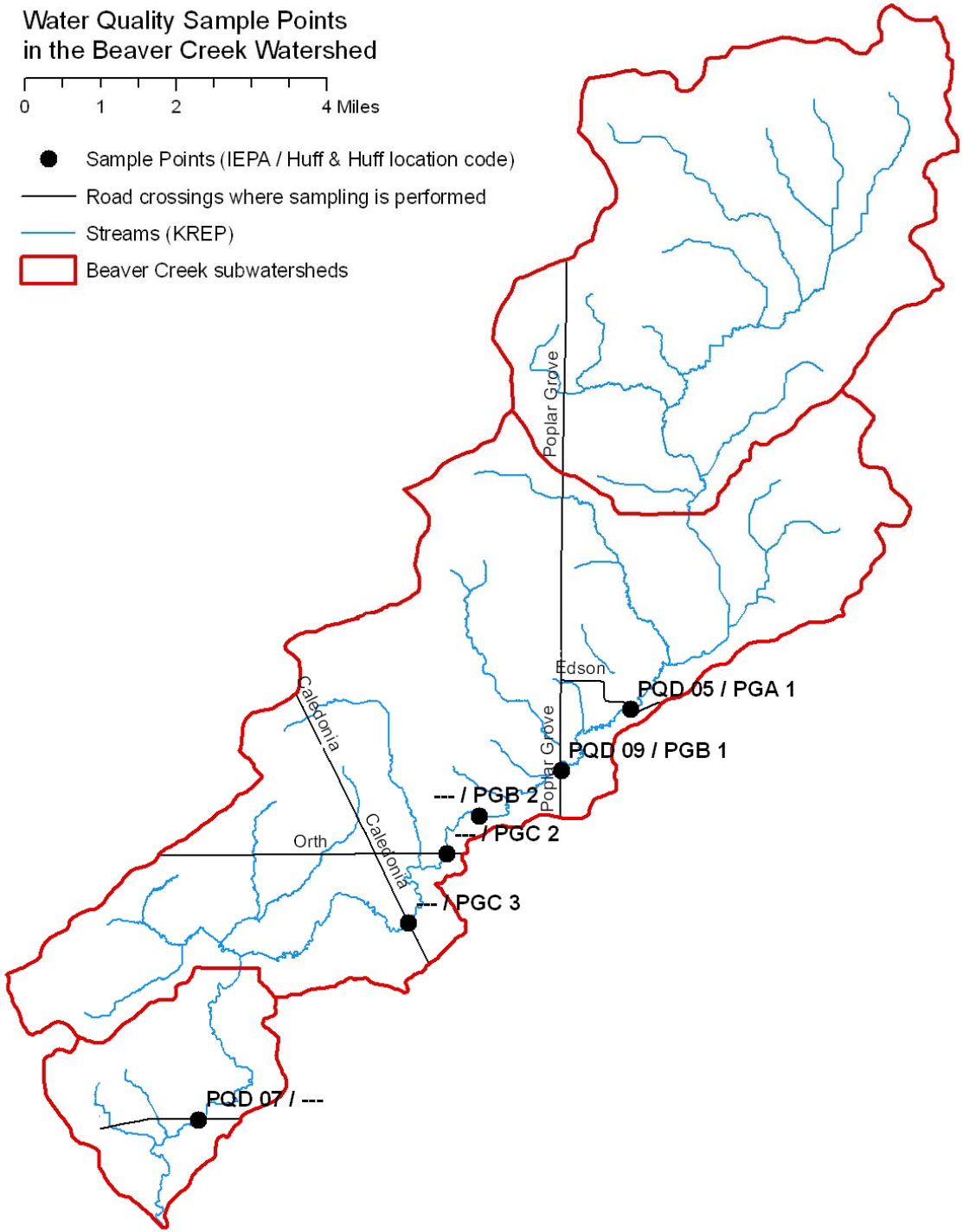
- Index of Biotic Diversity
  - Combines 12 different measures relating to fish communities (abundance, predators, etc.)
  - Ranges 10 to 60, higher is better
- Macroinvertebrate Biotic Index
  - Average tolerance of organisms weighted by abundance
  - Ranges from 0 to 11, lower is better

Impairment Criteria

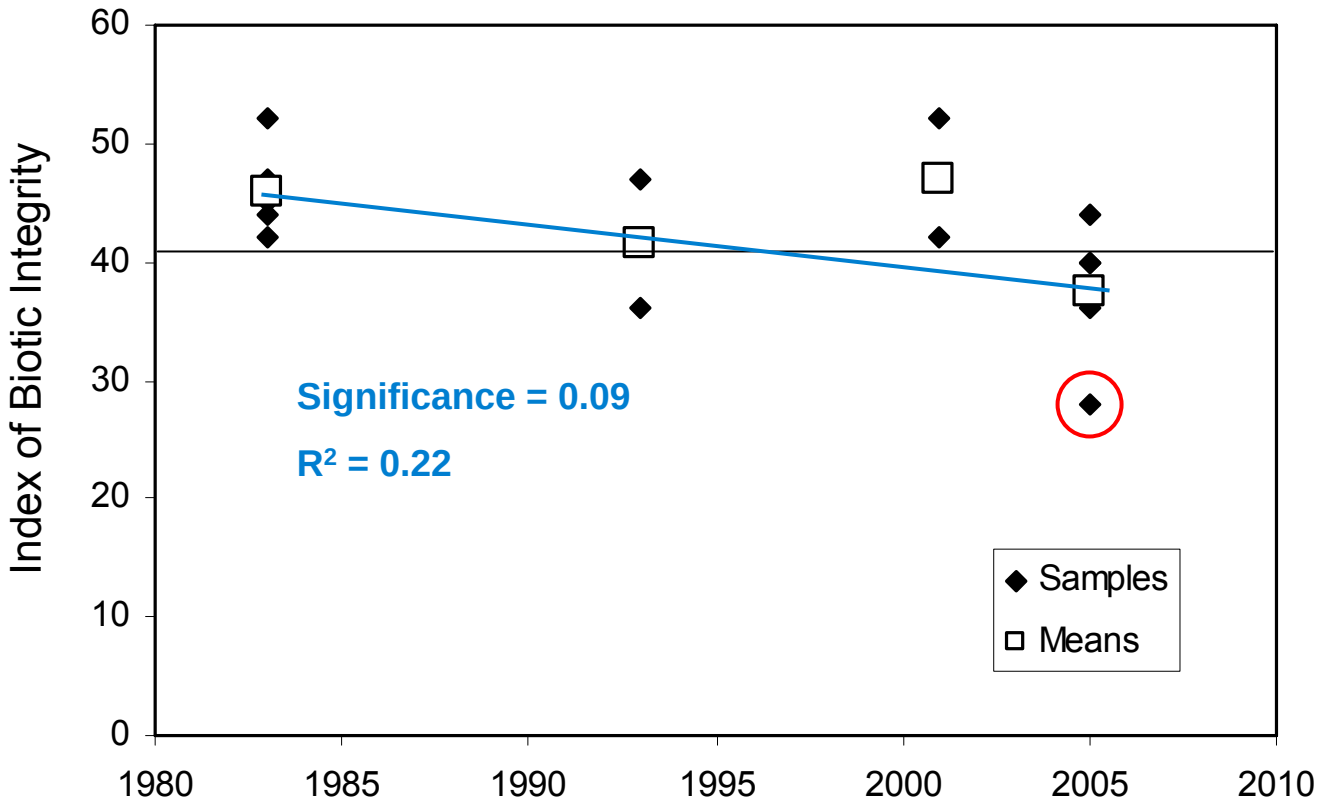
Biological Indicator			
Index of Biotic Integrity	≤ 20	20 < *x* < 41	≥ 41
Macroinvertebrate Biotic Index	> 8.9	5.9 < *x* < 8.9	≤ 5.9

Interpretation			
Impairment Status	Severe	Moderate	None
Designated Use Support	Not Supp.	Not Supp.	Fully Supp.
Resource Quality	Poor	Fair	Good

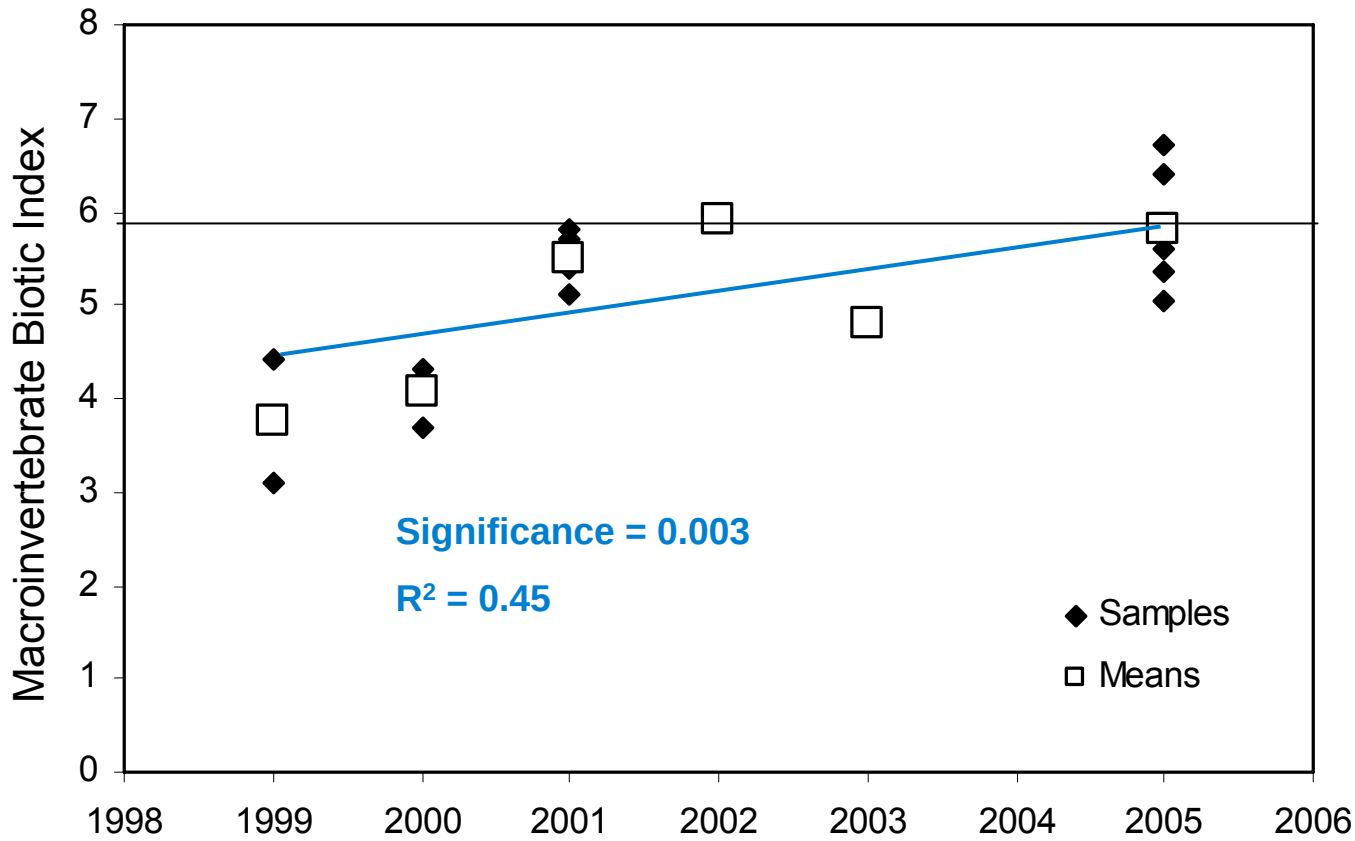
Water Quality Sample Points



Historical IBI – Fish data



Historical MBI – Bug data



Biological endpoints

- No detectable declining trend in fish data?
- Clearly worsening trend with bug data
- Aquatic life is probably slightly impaired
  - It is recommended that the plan make recommendations as if impairment exists or is imminent
- But what exactly are existing conditions?

Biological endpoints

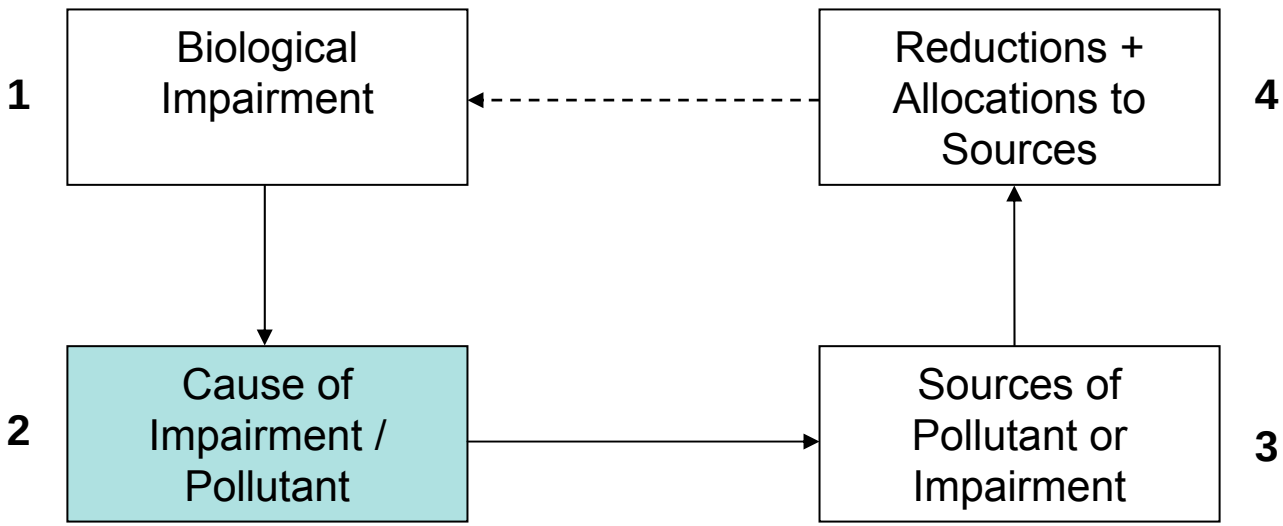
	Median	Mean	Mean ± CI	Change needed
IBI	40	40	35	18%
MBI	5.6	5.6	5.9	0%

Based on last 5 years for which data are available.
Confidence interval is 95%.

May we instead recommend:

	Median	Mean	Mean ± CI	Change needed
IBI	41	42	38	8%
MBI	5.6	5.6	5.9	0%

Dataset now excludes low outlier (IBI = 28) from 2005


1
Biological Impairment
Reductions + Allocations to Sources
4
2
Cause of Impairment / Pollutant
Sources of Pollutant or Impairment
3

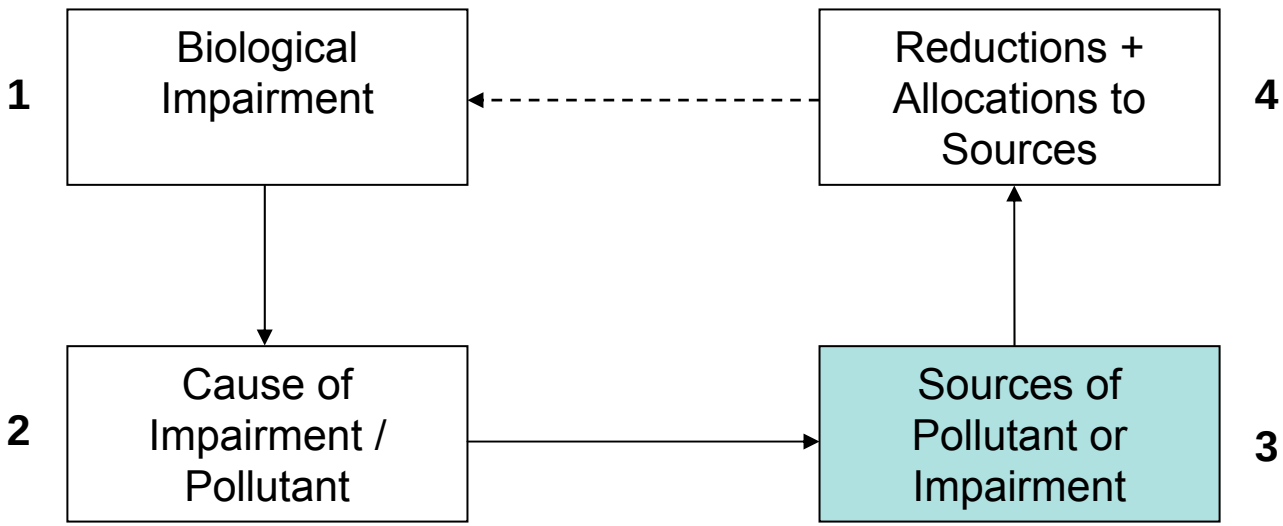
Potential causes of impairment

- Based on professional judgment regarding land uses and landscape, the causes of impairment probably area:
  - Sedimentation
  - Total nitrogen
  - Habitat alteration
- What are others?

Recent chemical water quality

- Aug 30 – Sept 22, 2005; Huff and Huff, Inc.

- Dissolved oxygen exceeded standard in 6% of samples
- Total phosphorus was ~10x historical level
- Nitrite + nitrate about ½ of historical level
- Ammonia about the same


1
Biological Impairment
Reductions + Allocations to Sources
4
2
Cause of Impairment / Pollutant
Sources of Pollutant or Impairment
3

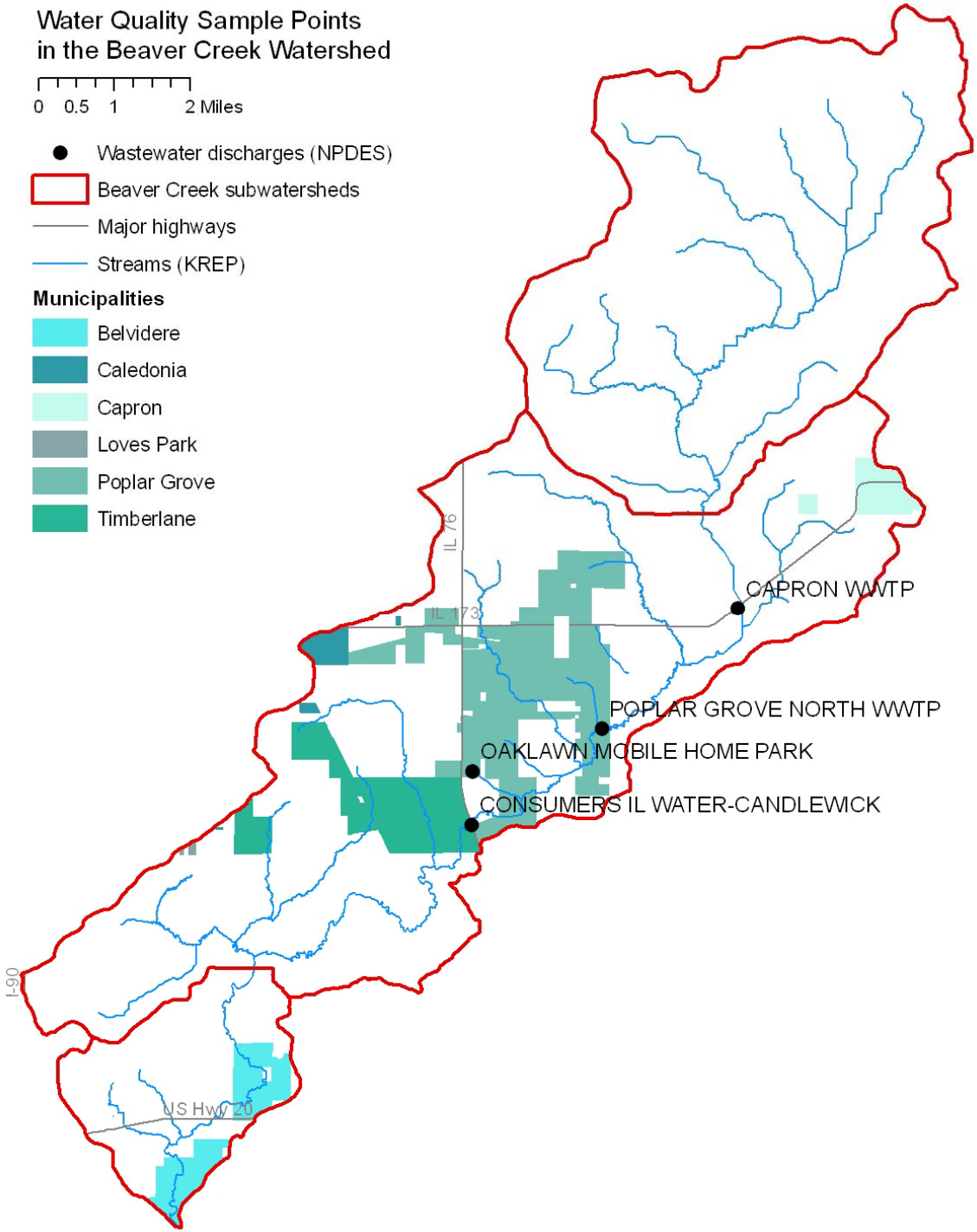
Stakeholders and sources

Cause	Potential stakeholder	Potential reason
Sediment (type)		
Sheet / rill erosion	Agriculture (row crops)	Row crops
	Municipalities	Inadequate construction controls
	County	Inadequate construction controls
	Construction, development	Inadequate construction controls
Streambank erosion	Municipalities	Runoff rate increase from urbanization
	County	Runoff rate increase from urbanization
	Construction, development	Runoff rate increase from urbanization
Nitrogen	Municipalities (WWTPs)	Lack of tertiary treatment
	Municipalities (MS4s)	Lack of water quality BMPs, source control
	Agriculture (row crops)	Fertilizer; high soil nitrogen
	Homeowners (septic tanks)	Failure; poor design
Habitat alteration	Landowners	Channelization, no buffers

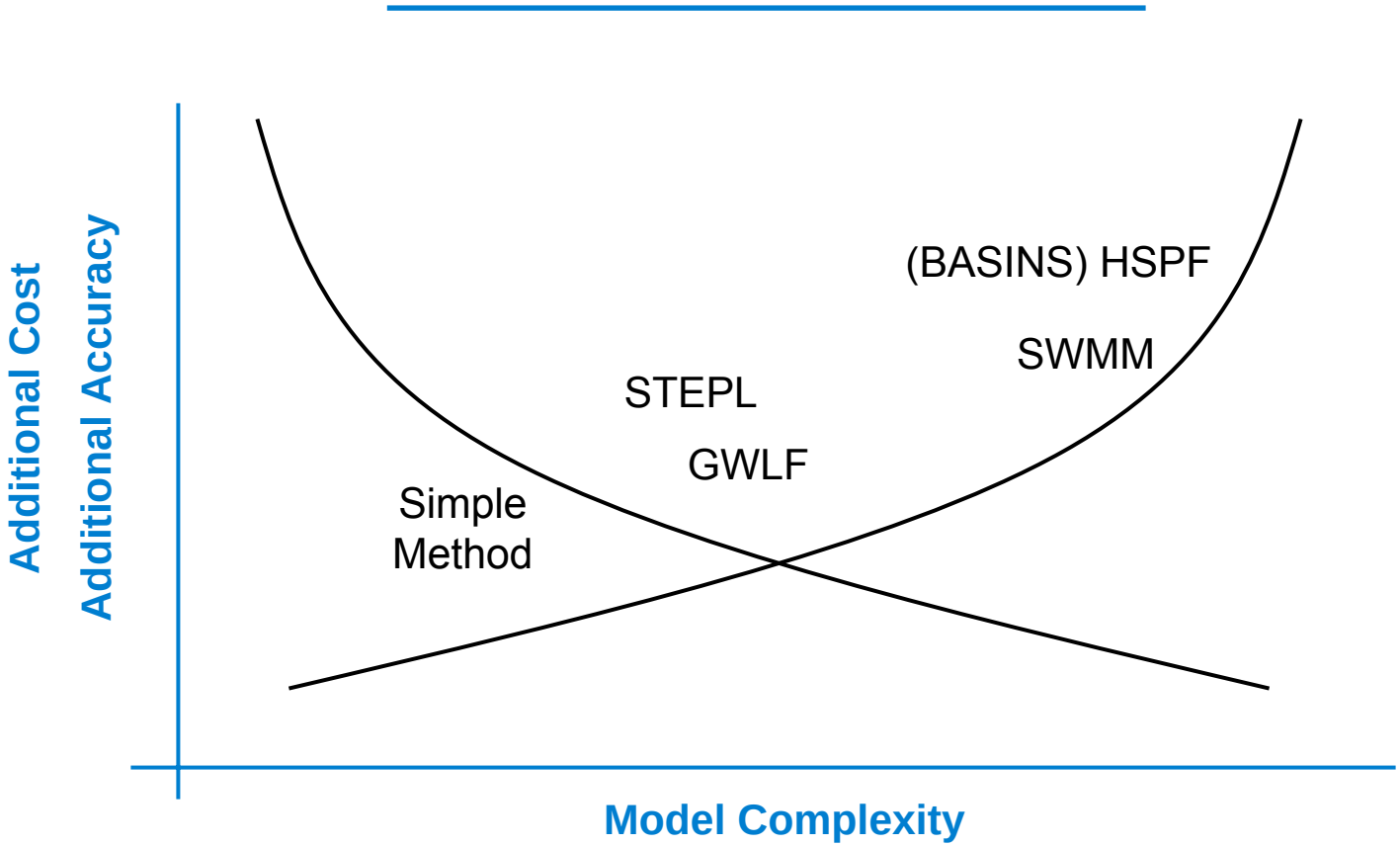
Model questions

- Will management actions result in meeting load reduction targets?
- What are the main sources of the load and how much do they contribute?
- How will loading change under future land use conditions?

Wastewater discharges



Model Selection



Summary

- Using 2001 data, Illinois EPA did not list Beaver Creek as impaired. Recent data suggests mild impairment, especially to fish communities.
- The Index of Biotic Integrity needs to increase by a minimum of 8 percent to fully support aquatic life.
- We need to hold the line on the Macroinvertebrate Biotic Index

- Causes of impairment must be identified based on local knowledge and professional expertise.
- Load reduction targets should be selected to meet aquatic life support goals and allocated to the sources/stakeholders thought to be responsible for them.